

**2001-2003 18-Month Report:
ABOVE: The AIRS BBAERI Ocean Validation Experiment**

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Submitted to

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1 Summary

This report summarizes work performed during the first 18 months of funding for this proposal, September 2001 - February 2003. Major project milestones include (1) the successful first deployment to Chesapeake Light of the full ABOVE instrument complement, (2) the delivery of the preliminary dataset from the first ABOVE deployment to the AIRS Science Team, (3) the use of preliminary ABOVE dataset by Larrabee Strow to revise AIRS Forward Model, and (4) the ongoing analysis of first ABOVE dataset for preliminary AIRS retrieval product validation. Thus, the first year and first ABOVE deployment (ABOVE02) objectives have been accomplished with research already progressing on to the objectives planned for the second deployment, AIRS retrieval product validation. Due to his inability to provide the agreed upon radiosondes and associated instrumentation in a timely manner for ABOVE02, Frank Schmidlin was removed as Co-Investigator with UMBC personnel taking on radiosonde launch responsibilities.

As originally proposed, the first ABOVE deployment to Chesapeake Light started nearly at launch plus three months on August 8, 2002. From then until October 12, 2002, 59 days of observations were obtained including 82 radiosondes launches, 53 timed for Aqua overpasses. The primary purpose for this long initial ABOVE deployment was to provide early data for validation of the AIRS Forward Model; an objective already met with a revised AIRS Forward Model delivered by Larrabee Strow to JPL. Preliminary product validation presented herein includes AIRS temperature and water vapor profile retrievals, assessment of AIRS cloud clearing, initial AIRS SST retrievals. Planning now is underway for the second ABOVE deployment (ABOVE03) tentatively scheduled for May 24 - July 7, 2003, for continued evaluation of the AIRS Forward Model and intensive validation of AIRS retrieval products. We also are developing collaborations with other Aqua and Terra instrument teams to extend the use of ABOVE data to a larger scientific community.

2 ABOVE02 Deployment and Instrument Status

As outlined in the summary, ABOVE02 met the primary proposed objective of initial AIRS FORWARD MODEL validation and we already are addressing the secondary objective with initial validation of preliminary AIRS retrieval products. Other than the previously mentioned radiosonde issue, the one area of unexpected difficulty involved the cost of actual deployment logistics, helicopter and supply ship transport. Both these items, especially helicopter costs, greatly increased as a result of insurance liability after September 11, 2001. With our hard work, the cooperation of NASA Langley CERES contractors (collaborator Ken Rutledge), and additional support from the Aqua Validation Project Office, these difficulties were overcome.

2.1 BBAERI

The Baltimore Bomem Atmospheric Emitted Radiance Interferometer (BBAERI) made its first field deployment to Chesapeake Light June 25-29, 2002, for a full test of the UMBC built BBAERI deployment carriage mounted



Figure 1: BBAERI deployed at Chesapeake Light in its environmental enclosure suspended from the hoist monorail by the UMBC carriage.

from the lighthouse hoist monorail, see Figure 1. At this time, the ABB Bomem built BBAERI Environmental Enclosure was delivered to Chesapeake Light along with food, water, fuel, Helium, and other supplies in the first of two ABOVE02 supply ship visits. BBAERI operated continuously during ABOVE02 with the exception of times when personnel were evacuated from Chesapeake Light: August 26 - September 5, AIRS cooler failure; and September 9 - 12, tropical storm Gustav.

Preliminary SSTs, temperature and water vapor profiles, and cloud flags have been retrieved from BBAERI data. A recently discovered BBAERI calibration issue is under investigation with final re-calibration expected by mid-March. After final calibration, BBAERI temperature and water vapor profiles will be integrated with radiosonde profiles and other ABOVE02 measurements to produce our final merged product. Timeseries of initial calibration spectra from the BBAERI shortwave channel for 9/13/02 is shown in Figure 2 with preliminary temperature and water vapor retrievals are shown in Figure 3. This was a mostly clear day with only a few thin cirrus showing up as the vertical bands between 1900 and 2000 GMT. Tropospheric CO and O₃ retrievals from BBAERI spectra will be performed after final calibration. Initial comparisons with AIRS and MODIS SSTs are presented in a following section.

2.2 ELF

The UMBC Elastic Lidar Facility (ELF) made its first field deployment to Chesapeake Light during ABOVE02 using a UMBC built rig and firing the laser through a former air duct opening in the lighthouse flight deck. ELF's primary responsibility during ABOVE is to determine the degree of sky obscuration during Aqua overpasses using a dual wavelength (1064 and 532 nm) Nd-YAG laser/detector system. Probing to altitudes exceeding 15 km with 1 minute time resolution, ELF nominally operated from one hour before to one hour after each Aqua overpass. Some extended ELF runs were made around sunrise to explore the decay and growth of the marine boundary layer.

The quality of ELF 532 nm data was excellent for the period after September 6, 2002. Prior to that, the detector package had a slight misalignment which affected both aerosol channels. However, after correcting this, a non-linear detector response occurs when the APD is over-driven by low altitude returns. This makes correction of the high altitude (8-15 km) returns difficult. Algorithms to improve these retrievals are under

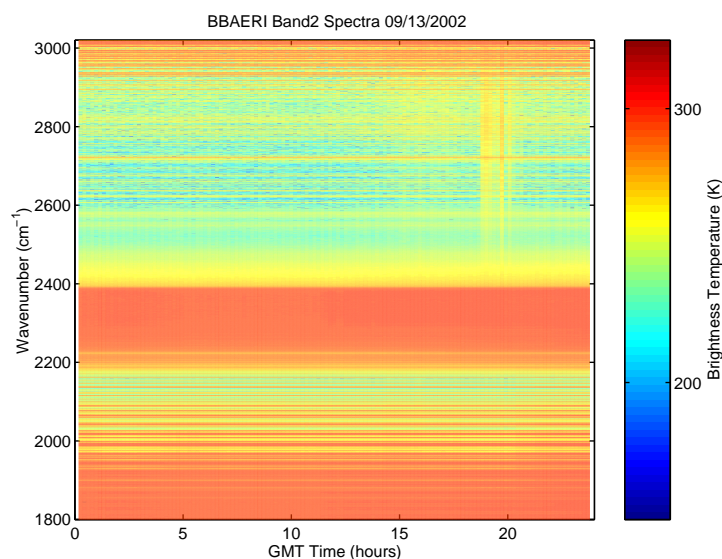


Figure 2: Timeseries of BBAERI Channel 2 (shortwave) spectra for 9/13/02. Thin cirrus are evident between 1900 and 2000 GMT due to scattering of solar photons. Spectral features are indicated as horizontal banding.

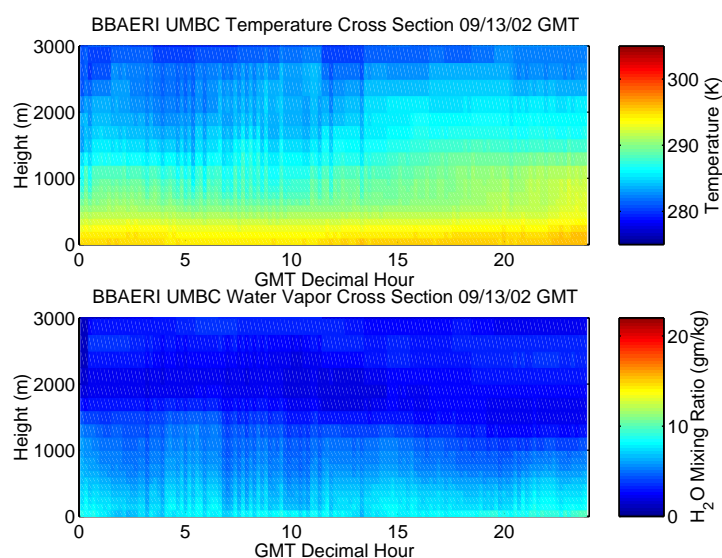


Figure 3: Timeseries of preliminary BBAERI retrieved temperature and moisture profiles for 9/13/02.

development, but in this report we focus on the 532 nm data. Seventy-five overpass periods were measured and the quick look data for these profiles can be found at

http://physics.umbc.edu/~hoff/alg/elf/elf_quicklooks.

These form the basis of a M.S. thesis in Physics for Mr. Joe Comer.

ABOVE02 results demonstrate that finding periods of completely cloud-free conditions at overpass times is a daunting task. Only six of the seventy-five periods have been classified as "severe clear". These cases identified by the ELF system have been used for the initial AIRS comparison, discussed in a later section. ELF

measurements prompt several questions including, "How clear is clear?" and "How clear does it have to be for AIRS not to be affected by high cloud?" At the time of this report, we can answer the first question while the second question is the subject of our ongoing data analysis and comparison to AIRS spectra. Examples of ELF cloud results appear in the Cloud Fraction subsection of AIRS Product Validation.

2.3 Radiosondes

After the departure of Mr. Schmidlin from the ABOVE project, we contacted Vaisala to acquire 128 RS-90 GPS radiosondes and a ground station. Vaisala responded with speed and excellent customer support. A total of 82 successful radiosonde launches were performed from Chesapeake Light during ABOVE02, 68 RS-90 GPS sondes and 14 RS-80 sondes. During a pair of RS-90 ground-station failures (August 21-26, September 6-9), RS-80 sondes were flown using equipment courtesy of the CERES science team. Launching radiosondes from Chesapeake Light was sometimes an exciting venture due to windy conditions and the elevation of the flight-deck off the ocean. Although the flight-deck seems spacious, numerous sharp corners and antennas present obstacles to balloons.

All radiosonde profiles were quality checked and the full unprocessed profiles were promptly delivered directly to Larrabee Strow for use in AIRS Forward Model validation along with our comments as to cloud cover, etc. These profiles also were delivered to JPL for use by the entire AIRS Science Team. To date, we have made no adjustments to these rough profiles to correct for possible biases or time-lags in RS-80 and RS-90 measurements. We will investigate the impact of these corrections on our profiles. By May 1, we expect to deliver our final profile products to JPL including all BBAERI and ELF information. Radiosonde quicklook skewT plots are available online

<http://physics.umbc.edu/~emaddy/quicklooks/quicklooks.html>

2.4 All-sky Camera

During all day-time overpasses, All-sky images were taken with a fish-eye lens attached to a Nikon Coolpix 995 digital camera purchased specifically for this purpose. All these images have been archived and will be posted to a website for access.

2.5 In situ O₃

Through a collaborative venture with Eric Hintsa of the Woods Hole Oceanographic Institute (WHOI), two in situ O₃ gas samplers were deployed to Chesapeake Light from September 5 - October 7, 2002. Dr. Hintsa's involvement came at very little cost, only travel costs from WHOI to Norfolk and space available transport to/from the lighthouse. The return will be providing a necessary ground point for tropospheric O₃ retrievals from BBAERI spectra. Dr. Hintsa is expected to collaborate again during ABOVE03 when we also deploy a UMBC in situ O₃ gas sampler and a CO gas sampler. Retrievals of tropospheric O₃ abundances from BBAERI spectra is the subject of Mr. Kurt Lightner's Ph.D. research.

3 AIRS Forward Model Validation

As the primary objective for ABOVE validation of the AIRS Forward Model took center-stage during ABOVE02. Fortunately, nature provided 6 instances of severely clear skies over Chesapeake Light coinciding with Aqua overpasses, AM overpasses on 9/13, 9/22, and 10/3, and PM overpasses on 9/30, 10/1, and 10/2. Radiosonde profiles with ELF confirmation of clear skies from these 6 cases form the key dataset provided to Larrabee Strow for validation and improvement of the AIRS Forward Model. Along with profiles from the SGP ARM

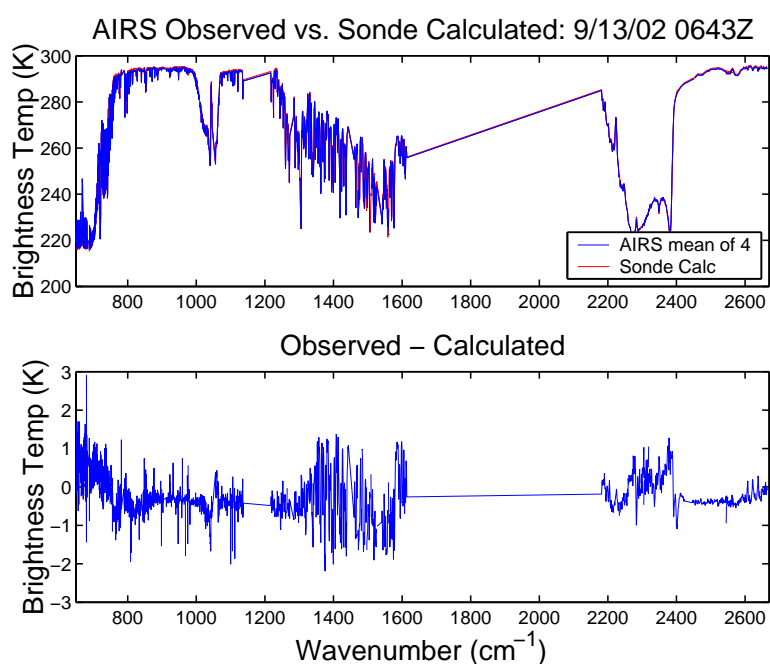


Figure 4: Comparison of 4 observed AIRS spectra with calculations from the ABOVE 9/13/02 AM radiosonde profile.

site, these ABOVE profiles enabled Dr. Strow to revise and improve the AIRS Forward Model in a timely manner as we originally proposed. Continued analysis of the full ABOVE02 dataset, along with the other validation datasets, by Dr. Strow and his team may lead to further refinements in the AIRS forward model.

Figure 4 presents one example of the comparisons used to validate AIRS Forward Model, AIRS observed spectra and computed spectra from one of the ABOVE02 radiosonde profiles. The good agreement is evident in the lower plot with differences generally less than ± 1 K. The ~ 0.5 K bias in window regions comes from Dr. Strow using ECMWF SST values rather than those derived from BBAERI ABOVE02 measurements. At the time of this original calculation, BBAERI SSTs were not yet available. BBAERI SSTs for this case are ~ 0.5 K lower, bringing the window regions into closer agreement. As part of our final ABOVE02 product delivery, we will assess the impacts of corrections to our radiosonde profiles on these spectral comparisons. One of the key items we are working on is merging the radiosonde profile with available model data to correct the temporal and spatial aspects of the radiosonde profile to yield a best guess vertical profile over the lighthouse at the time of Aqua overpass. As Figure 5 shows, radiosondes often trace a horizontal path through multiple satellite fields of view (FOVs) during their 1-1.5 hour transit from the surface to 50mb or above. This is not a unique problem to ABOVE data, but is one requiring some thought and consideration when performing analysis of any validation data.

4 AIRS Product Validation

Due to a close working relationship with Dr. Chris Barnet and the support of AIRS PI Dr. Mous Chahine, we already have started to examine preliminary product retrievals from AIRS spectra and are providing invaluable feedback as we commence product validation. A number of subtle, and not so subtle bugs in the AIRS retrieval code have been corrected already or are under study. In particular, a number of issues centered on the Microwave antenna pattern are the likely sources for inaccuracies in AIRS moisture retrievals

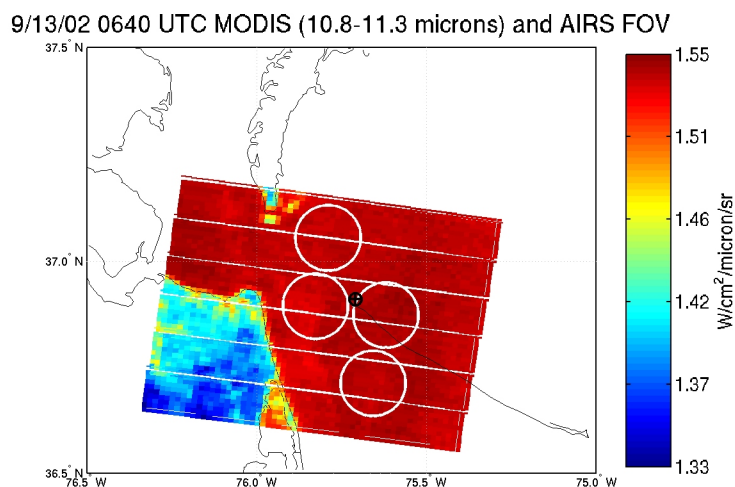


Figure 5: Map showing the locations of the AIRS IR FOVs for the four spectra shown in Figure 4 and the path of the 9/13/02 AM ABOVE02 radiosonde.

when compared to validation profiles. These issues went undetected in comparisons of AIRS retrievals to model fields, thus reinforcing the utility of such specific validation measurements as ABOVE. Furthermore, the decision of whether to perform radiance tuning or to use a more sophisticated form of error covariance assignment has been impacted by early comparisons of AIRS retrievals to validation data. However, as shown below, AIRS temperature retrievals already are approaching the goal of 1 K accuracy in 1 km layers in the troposphere. Initial AIRS SST retrievals are similarly impressive.

4.1 Temperature and Water Vapor Profile Validation

The first cases we examined to assess the quality of AIRS product retrievals were the same 6 severely clear examples we used for Forward Model validation. Immediately, we ran into a problem with these initial AIRS retrievals in that two of the overpasses had missing data and two others had rejected retrievals due to other errors. Results for the remaining two cases are shown in Figures 6 and 7. In both of these examples, we see ECMWF temperature profiles are superior to either the untuned (error covariance) or the tuned AIRS retrievals. However, for water vapor the untuned (error covariance) AIRS retrieval is superior to the tuned one and the ECMWF model below 850 mb, but the ECMWF is significantly more accurate between 550 and 850 mb.

Figure 8 presents a statistical comparison of these two clear cases computed on the "official" AIRS 1 km layering scheme as used in AIRS simulation evaluations. Note, this and the subsequent statistical comparison plots do not include the lowest fractional 1 km layer of the atmosphere due to a coding problem to consistently account for this fractional layer as the AIRS team does. We will resolve this issue shortly. What the plots do show, is the good performance of the AIRS temperature retrievals, and the, thus far, poor performance of the water vapor retrievals. The cautionary note here is these are extremely preliminary retrievals and contain several known errors with corrections already in the works.

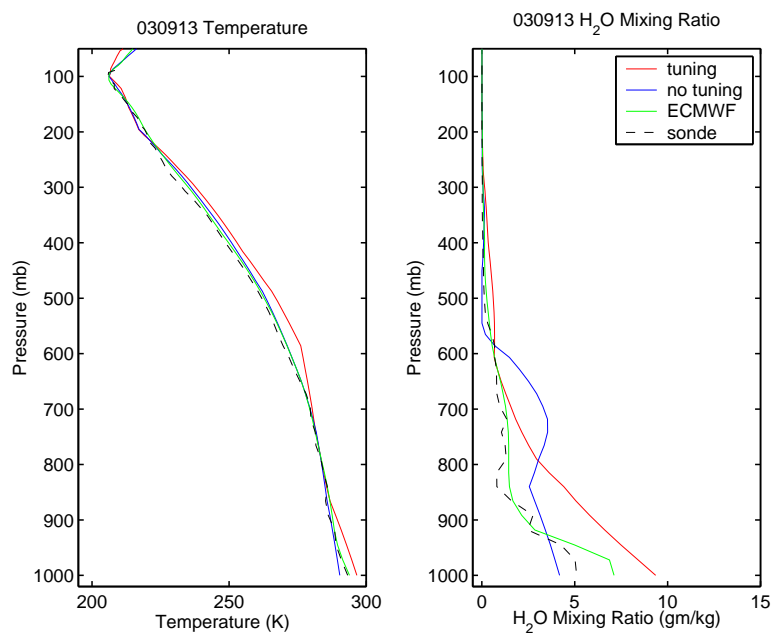


Figure 6: Plots of Radiosonde, AIRS retrievals, and ECMWF profiles for 9/13/02 from Chesapeake Light.

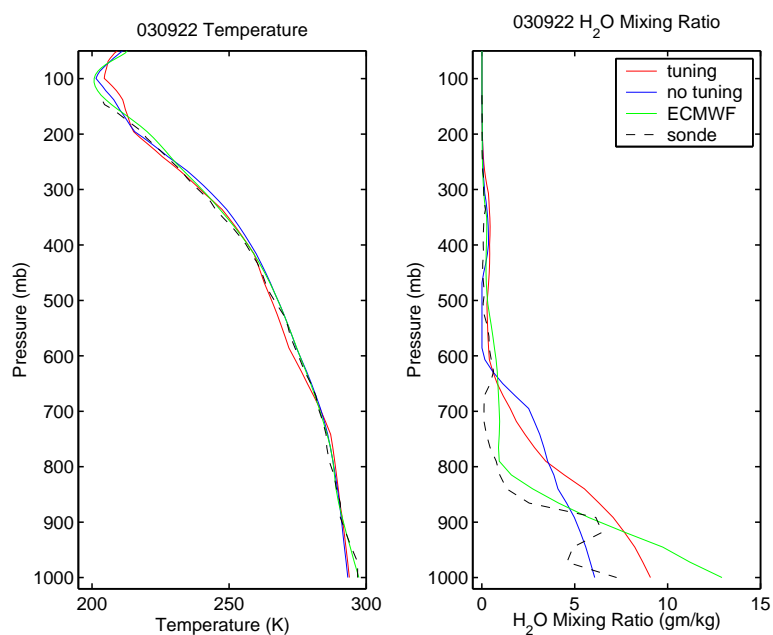


Figure 7: Plots of Radiosonde, AIRS retrievals, and ECMWF profiles for 9/22/02 from Chesapeake Light.

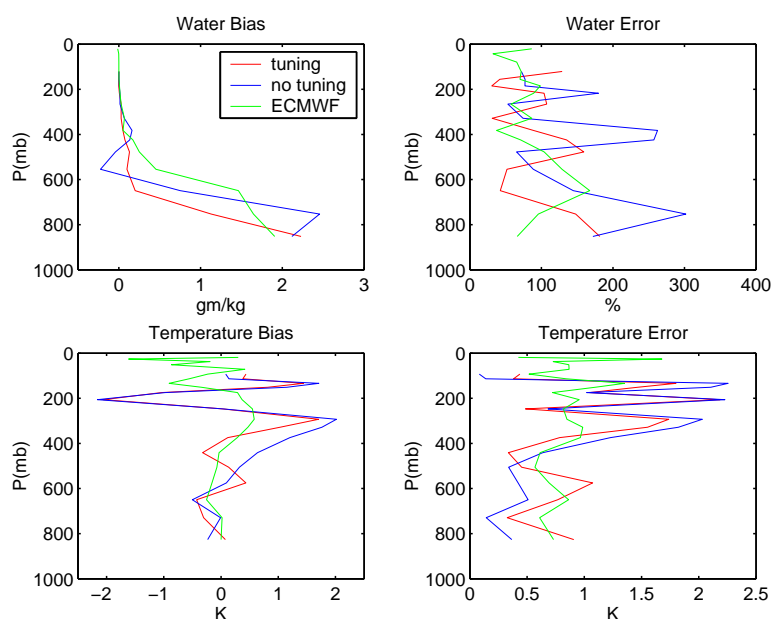


Figure 8: Statistical comparisons of AIRS retrievals, tuned and untuned (error covariance), and ECMWF model profiles to two clear ABOVE validation profiles (9/13 and 9/22/02).

4.2 Cloud-clearing and Retrievals

Expanding the statistical comparisons beyond just the two clearest cases to include cases with up to 80% cloudy FOVs yield the results summarized in Figure 9 for 14 cases in the tuned retrievals and 17 cases in the untuned. This figure shows a degradation in the quality of AIRS temperature retrievals from the two clearest cases, but still an impressive error of only 1-1.2 K throughout most of the troposphere for these early retrievals. Although the water vapor errors are now smaller with more cases to compute statistics for, they are still quite large in the 50-100% range throughout the troposphere.

Expanding the comparisons to all 23 thus far available out of our total possible number of 53 (some granules are still missing from the dataset available to Dr. Barnet for this processing) including 9 cases with retrievals rejected for various reasons (but not due to excessive clouds), yields the statistical results of Figure 10. With these 23 cases, the temperature errors have increased to a mean near 1.25K in the lower half of the troposphere, but the water vapor errors in the same region have decreased slightly. One can argue the meaning of statistical comparisons with such small numbers of profiles, but we can only use what we have available. Working closely with Dr. Barnet, we will expand this number to the maximum possible 53 by obtaining and processing all applicable granules of AIRS data, and we will look in great detail at all 53 cases to maximize our yield. Automated processing routines will be developed for consistent and accurate statistical comparison of all available data.

4.3 Cloud Fraction

In addition to performing retrievals under partially cloudy conditions and providing so-called cloud cleared radiances, AIRS retrieves a research product of cloud fraction. In the retrieval this parameter is really more like the fraction of an AMSU FOV covered by a totally opaque cloud or one could see it as the entire FOV is covered by a cloud of 'cloud fraction' opacity. ELF observations can help assess the quality of this AIRS product by using the lidar return timeseries to obtain a percent occurrence of clouds integrated over a time

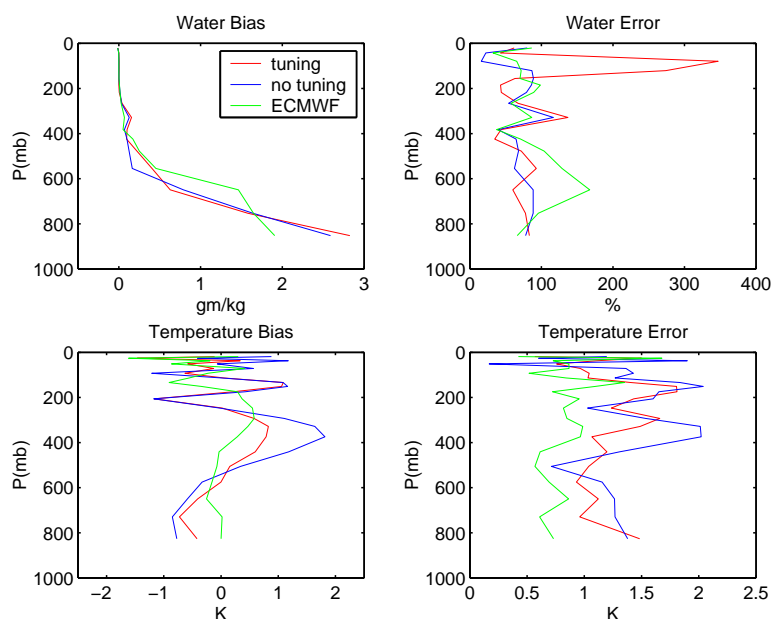


Figure 9: Statistical comparisons of AIRS retrievals, tuned and untuned (error covariance), and ECMWF model profiles to 17 ABOVE radiosonde profiles with 0-80% cloud cover.

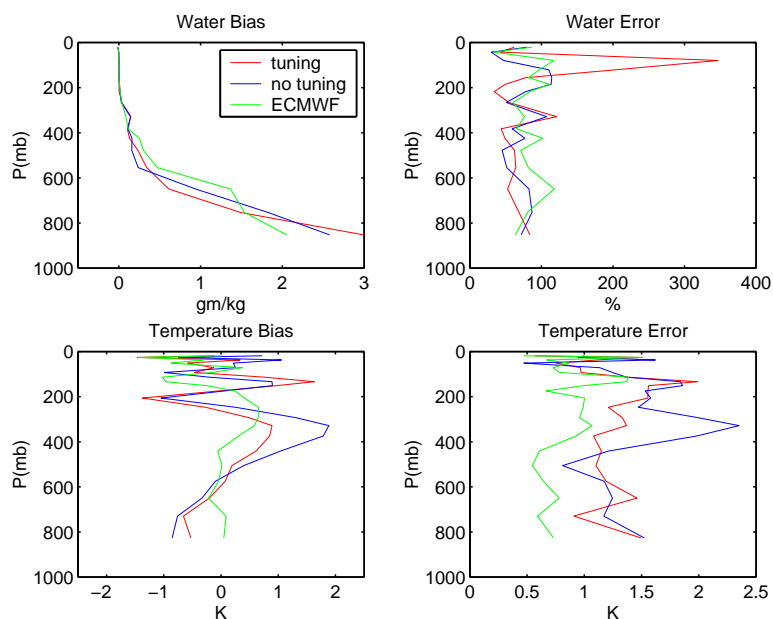


Figure 10: Statistical comparisons of AIRS retrievals, tuned and untuned (error covariance), and ECMWF model profiles to all available ABOVE radiosonde matchups at this time with less than 80% cloud cover.

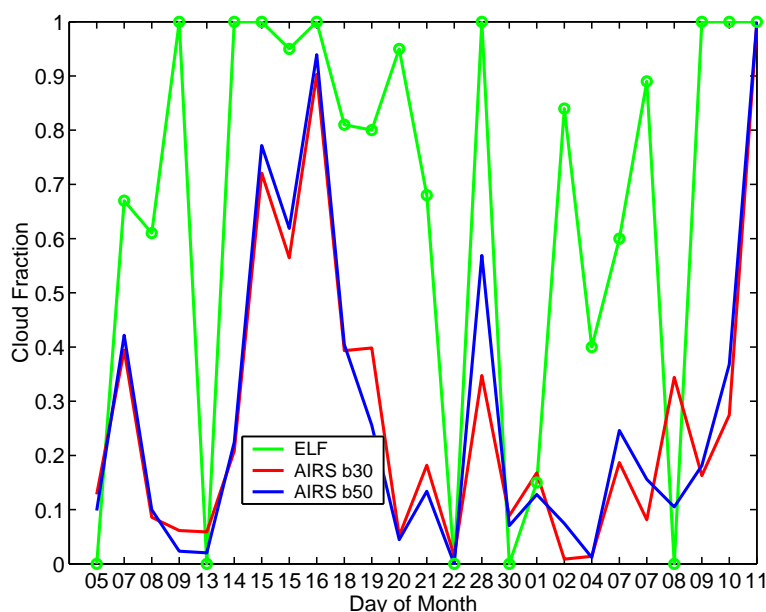


Figure 11: Comparison of AIRS retrieved cloud fraction and ELF derived area cloud fraction.

comparable to the size of an AMSU footprint combined with a retrieved cloud optical depth from the lidar data. Assuming a nominal 10 m/s cloud wind velocity gives us an ELF cloud integration time of 66 minutes to cover an AMSU 40 km FOV. Only selected cases of ELF optical depth retrievals are presented here because final ELF data processing is underway. Thus the first AIRS cloud fraction comparisons shown in Figure 11 are with the ELF area cloud fraction. A proper comparison to the AIRS retrieved cloud fraction will result from dividing the ELF area cloud fraction by $(1 - \text{transmission})$ of the cloud at $15\mu\text{m}$ yielding lower values than those we present here. The conversion of optical depth at ELF's 532 nm to AIRS $15\mu\text{m}$ introduces yet another source of uncertainty in this comparison.

In general, this plot shows ELF is more sensitive to clouds than AIRS. However, one must remember this is only the ELF area fraction along a line that may or may not even correspond to the AIRS value and includes no cloud opacity effects. Once ELF optical depths are available for all cases, a more complete and accurate comparison of cloud fractions will be possible. Moreover, the AIRS value presented here is for the single closest AMSU FOV. As Figure 12 shows, the closest FOV can be quite close to the lighthouse, but generally is not centered on the lighthouse. In a more detailed comparison, we will look at the AIRS retrieved cloud fractions for the individual IR FOVs near the lighthouse. This case, one of our severely clear cases, shows AIRS did a good job of saying the area near the lighthouse had less than 10% clouds. However, Figure 11 indicates several times where ELF found 100% clouds and AIRS said it was essentially clear, such as 9/9 and 9/20.

Figure 13 shows the map of all AIRS cloud fraction retrievals within 200 km of the lighthouse on 9/9/02 with less than 10% clouds prevailing within 100 km. Unfortunately, the real conditions on Chesapeake Light this day were far from clear as the ELF timeseries of Figure 14 indicates the low marine deck hammering the lidar signal at 300m. These clouds were the outer edges of tropical storm Gustav. This indicates the difficulties for these early retrievals with seeing low clouds and perhaps uniform cloud cover over an AMSU FOV.

Lest one think the difficulties with AIRS cloud fractions lies solely with low clouds, 9/20/02 presents an example where AIRS did not see a cirrus deck. Figure 15 shows the AIRS retrieved cloud fractions again indicating generally clear skies offshore near the lighthouse. However, the ELF lidar timeseries for this data

9/13/02 0640 Barnet AIRS Retrieved Cloud Fractions

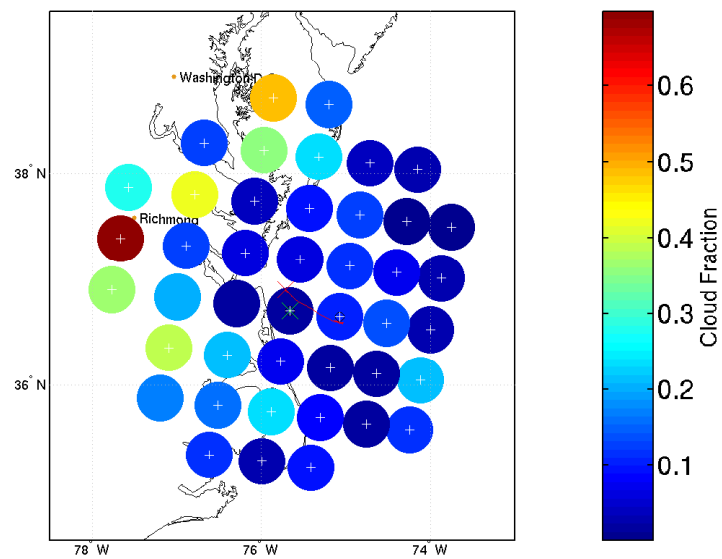


Figure 12: Map of AIRS retrieved cloud fraction from the AM overpass on 9/13/02 within 200 km of Chesapeake Light (red x). Radiosonde track is shown in red, good retrievals (white marks), closest retrieval (green x), closest retrievals to sonde track (black o).

9/9/02 0708 Barnet AIRS Retrieved Cloud Fractions

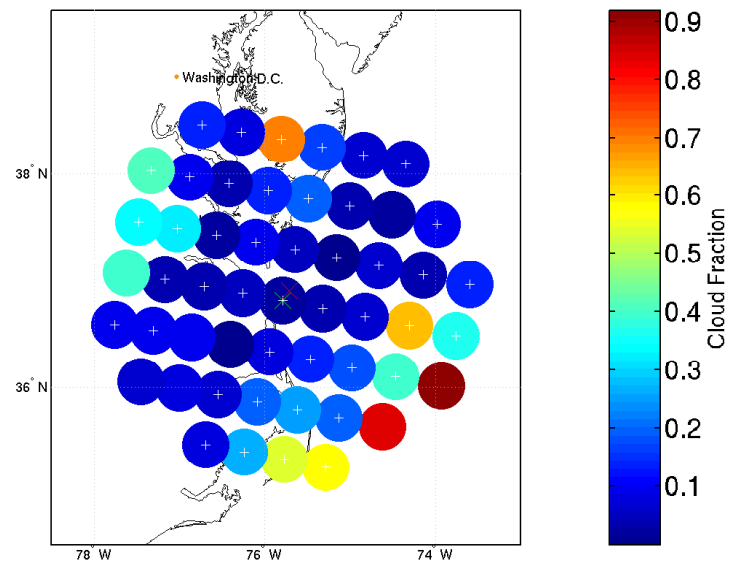


Figure 13: Map of AIRS retrieved cloud fraction from the AM overpass on 9/09/02 within 200 km of Chesapeake Light.

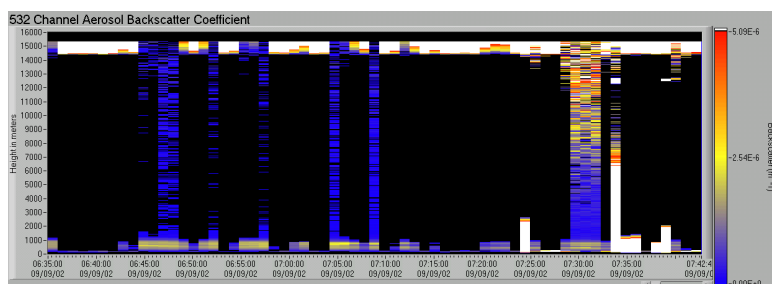


Figure 14: Timeseries of ELF returns for the AM overpass of 9/9/02.

9/20/02 0649 Barnet AIRS Retrieved Cloud Fractions

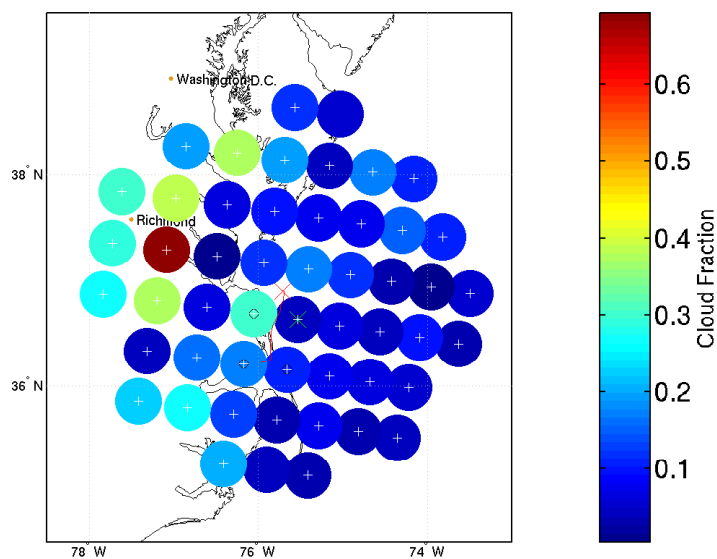


Figure 15: Map of AIRS retrieved cloud fraction from the AM overpass on 9/20/02 within 200 km of Chesapeake Light.

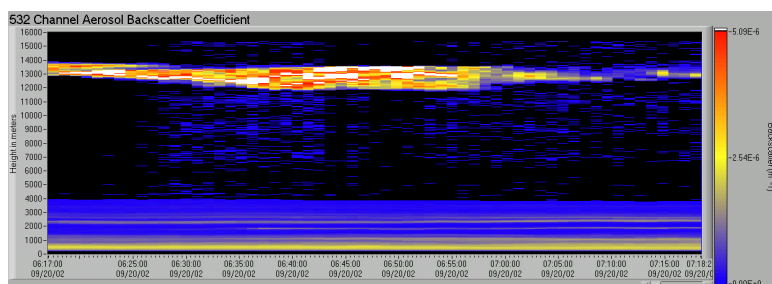


Figure 16: Timeseries of ELF returns for the AM overpass of 9/20/02.

and retrieved optical depths presented in Figures 16 and 17 show an extensive cirrus deck with optical depths approaching 0.15 at Aqua overpass. A complete analysis of all ELF optical depths and cloud fractions and comparisons to AIRS observations is underway as part of Mr. Comer's M.S. Thesis.

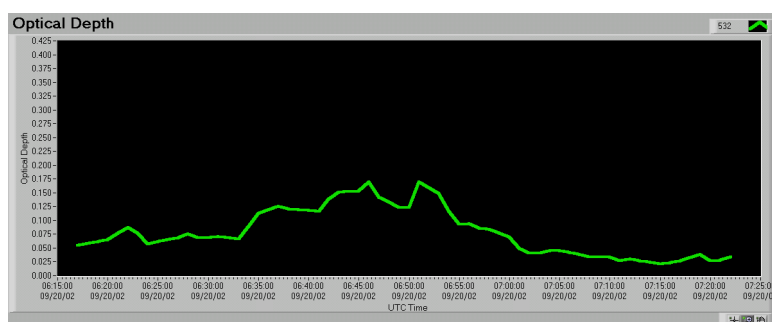


Figure 17: Optical depth at 532 nm retrieved from 9/20/02 ELF timeseries shown in Figure ELF920.

4.4 SST

Following the techniques of Peter Minnett, we have performed the first retrievals of sea surface temperature (SST) from BBAERI spectra obtained at Chesapeake Light during ABOVE02. Comparison of BBAERI retrievals to the first AIRS SST retrievals indicates good agreement under clear conditions, see Figure 18. For the clear overpasses of 9/6, 9/13, and 9/22, BBAERI $7.6 \mu\text{m}$ SSTs agree to within 0.15 K with SSTs retrieved from AIRS 2616 cm^{-1} spectral regions. The other days in the plot are ones where ELF indicated thin cirrus conditions. Similarly good agreement between preliminary BBAERI SSTs and Terra MODIS SSTs is presented for the one case thus far available, 10/3/02. Figure 19 presents MODIS SSTs near Chesapeake Light and shows considerable variations (1.6 K) on the 40 km scale of a MODIS FOV. Figure 20 presents the comparison of BBAERI SSTs and the mean MODIS SST in 1 km concentric range rings centered on the lighthouse. The range of BBAERI SSTs covers measurements ± 30 minutes of overpass. By luck, the BBAERI measurement closest in time to the Terra overpass was the minimum one and should be most directly compared to the two MODIS pixels closest to the lighthouse – yielding a difference of 0.08 K. A more complete analysis of BBAERI SSTs and comparison to all available MODIS and AIRS retrievals awaits the final calibration of BBAERI.

4.5 Trace Gases

ABOVE validation of AIRS trace gas retrievals will commence after BBAERI final calibration expected in mid-March. Our standard CO retrieval algorithm will be used on all BBAERI data to obtain a full ABOVE02 CO timeseries. Mr. Lightner's research version ozone retrieval algorithm will be used on BBAERI data focusing on Aqua overpasses for validation of AIRS tropospheric ozone retrievals. Additional BBAERI data was acquired during a field deployment to Huntsville, Alabama in collaboration with Dr. Mike Newchurch and his launching of ozonesondes. These ozonesonde profiles will be quite useful for validation of BBAERI ozone retrievals. Surface ozone measurements at the lighthouse made by Dr. Eric Hintsa will also be quite useful for BBAERI validation. During ABOVE03, we plan to deploy UMBC ozone and CO in situ gas analyzers in addition to again collaborating with Dr. Hintsa. Furthermore, we hope to convince Dr. Newchurch of the utility of several ozonesonde launches from the lighthouse during ABOVE03 and are willing to provide logistical support for this endeavor.

5 Other EOS Validation

We have begun to develop collaborations with other EOS science teams and research projects to provide synergistic validation opportunities from Chesapeake Light. As part of our AIRS SST validation research, we are working with Dr. Peter Minnett to obtain Aqua MODIS and Terra MODIS SST retrievals. At a meeting discussing results from CLAMS, we advertised the capabilities of ABOVE at Chesapeake Light and were

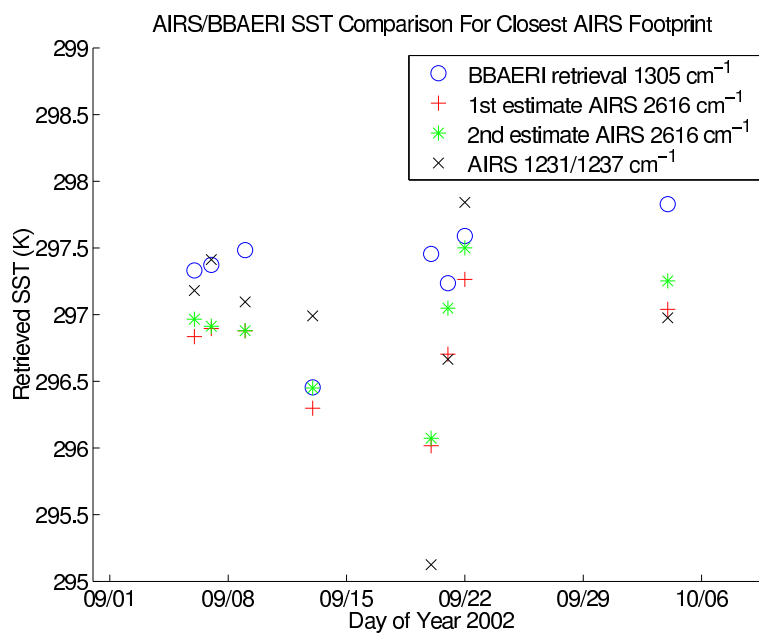


Figure 18: Comparison of preliminary AIRS and BBAERI SSTs. Best comparisons are for the clear days of 9/6, 9/13, and 9/20/02.

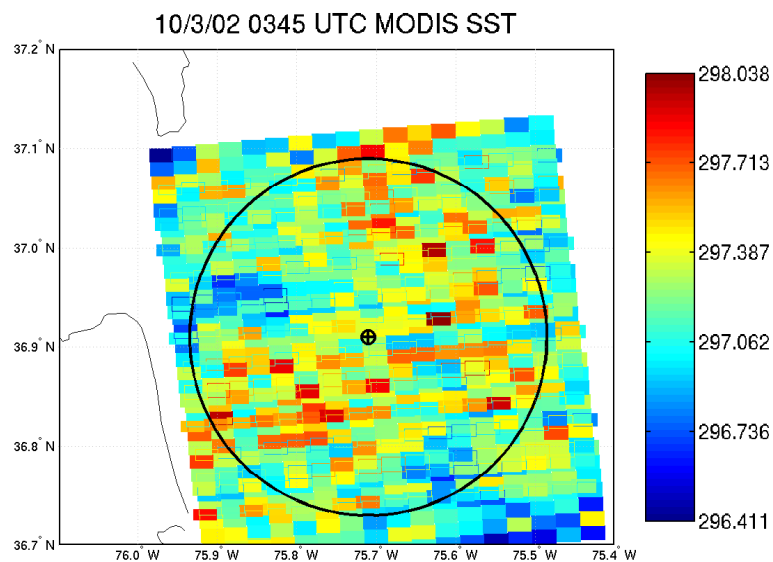


Figure 19: Map of Terra MODIS SSTs near Chesapeake Light (O+) and a 20 km range ring centered on the lighthouse approximating a nadir AMSU FOV.

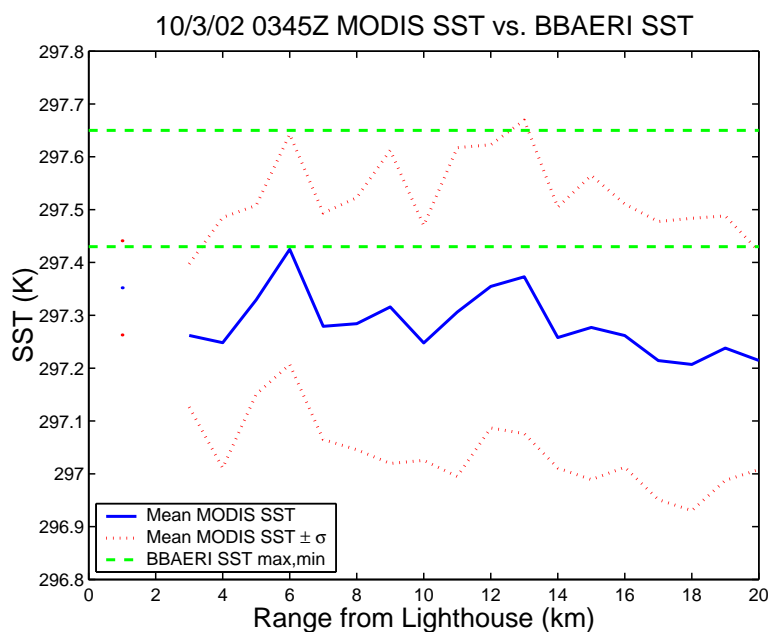


Figure 20: Comparison of BBAERI and Terra MODIS SST on 10/03/02.

encouraged by Dr. Ralph Kahn to coordinate some ABOVE03 activities with Terra overpasses for MISR validation. Collaborating with Ken Rutledge and his contacts with the CERES science team, we are providing ABOVE02 data for CERES validation and will attempt to expand our activities during ABOVE03 to include some Terra overpasses in addition to every available Aqua overpass. During ABOVE02, we also collaborated with Dr. Glenn Coda to perform water samples and clarity observations near the times of SeaWiFS overpasses and will continue this collaborative work during ABOVE03. To accommodate ABOVE03 data acquisition during some Terra overpasses, we plan to augment our normal lighthouse crew complement with one or more additional persons at key times to cover additional radiosonde launches. If this activity is important enough to collaborators or the project office, some fund augmentation may be required to cover the additional radiosonde costs.

6 Continuing Work

Work continues on preparing our final ABOVE02 dataset to the AIRS science team and for publication of our initial AIRS validation results. We expect to complete final ABOVE02 data compilation by the end of April, 2003. BBAERI final calibration is expected by the middle of March, 2003. Research will continue on AIRS product validation with our input key to decisions for the next AIRS software release for Level 2 processing and products to the DAAC.

7 ABOVE03 Deployment

Our target dates for ABOVE03 deployment are May 24-July 7, 2003, late spring into summer at Chesapeake Light. As previously mentioned, our objectives for ABOVE03 are to continue assessment of the AIRS Forward Model and intensive operations for validation of AIRS product retrievals. Logistical concerns should be less this year than for ABOVE02 having one field season at the lighthouse already completed. However, we do

our best to be prepared to handle unexpected events. One supply ship transport out is expected due to extensive supply carry-over from ABOVE02 in terms of fuel, food, and water. The main items to go out this time are mainly fuel and Helium, as well as some food, radiosonde supplies, and the BBAERI Environmental Enclosure. As just discussed in the Other EOS Validation section, we are attempting to coordinate ABOVE03 activities with other Aqua and Terra validation research to maximize our impact and data return. Hopefully Dr. Newchurch will agree to provide several ozonesondes for lighthouse launch during ABOVE03.

8 Presentations

ABOVE02 results have been presented at several scientific meetings as listed below. The final presentation listed involves Mr. Lightner's Ph.D. research on retrievals of tropospheric ozone from AERI's.

- McMillan, W. *et al.*, ABOVE02: Overview and Initial Results, presented at the NASA/EOS IWG Meeting, Ellicott City, MD, November 18-20, 2002.
- McMillan, W. *et al.*, ABOVE: The AIRS BBAERI Ocean Validation Experiment: Overview and Initial Results, presented at the Fall AGU Meeting, San Francisco, CA, December 6-10, 2002.
- McCourt, M. *et al.*, Observations of the growth and decay of the Marine Planetary Boundary Layer from the Chesapeake Light Platform, presented at the Fall AGU Meeting, San Francisco, CA, December 6-10, 2002.
- Comer, J. *et al.*, Subvisible Cirrus Detection using the UMBC Elastic Lidar Facility (ELF) During the ABOVE Experiment, presented at the Fall AGU Meeting, San Francisco, CA, December 6-10, 2002.
- McMillan, W. *et al.*, ABOVE: The AIRS BBAERI Ocean Validation Experiment, presented at the Optical Remote Sensing of the Atmosphere topical meeting of the OSA, Quebec, Canada, February 3-6, 2003.
- Lightner, K., First Results of Tropospheric Ozone Retrievals from the Baltimore Bomem Atmospheric Emitted Radiance Interferometer, presented at the Optical Remote Sensing of the Atmosphere topical meeting of the OSA, Quebec, Canada, February 3-6, 2003.
- McMillan, W. *et al.*, ABOVE Experiment Review and AIRS CO Validation, presented at the AIRS Science Team Meeting, Camp Springs, MD, February 25-27, 2003.

9 2003 Activities

Planned activities for calendar year 2003 include:

- Final ABOVE02 BBAERI calibration and retrieval products
- Final ABOVE02 ELF cloud product processing
- Final ABOVE02 Radiosonde profile corrections
- Final ABOVE02 dataset compilation and delivery
- Publication of first ABOVE observations and AIRS validation results
- Continued AIRS product validation research with ABOVE02 data
- ABOVE03 deployment, May 24-July 7, 2003.
- ABOVE03 data processing and delivery
- Presentations of ABOVE validation results at Scientific Meetings